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ABSTRACT

This self-paced student training module on boring and drilling tools is one of a number of modules developed for Pre-apprenticeship Phase 1 Training. Purpose of the module is to enable students to identify, select, and understand the proper use of many common awls, bits, and drilling tools. The module may contain some or all of the following: a cover sheet listing module title, goal, and performance indicator; study guide/checklist with directions for module completion; introduction; information sheets providing information and graphics covering the module topic(s); self-assessment; self-assessment answers; post assessment; and post-assessment answers. (YLB)

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ED217281

INDIVIDUALIZED LEARNING SYSTEMS

PRE-APPRENTICESHIP
PHASE 1 TRAINING

BORING AND DRILLING TOOLS

Goal:

Upon completion of this module, the student will be able to identify, select and understand the proper use of many common awls, bits and drilling tools.

Performance Indicators:

The student will demonstrate his or her knowledge by successfully completing both a Self Assessment and a Post Assessment exam covering the selection, use and maintenance of hand boring and drilling tools and attachments.

ED329117

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Introduction

No matter what trade he or she plans to enter, the apprentice will use some of the basic hand tools designed for boring or drilling holes, and should therefore thoroughly understand how to select, use and maintain tools of this type. The term "boring," as it is used in the building trades, means making holes in wood; "drilling" means making holes in metal. Among the tools commonly used in these operations are awls, punches, hand braces and bits, hand drills, breast drills and automatic (push) drills.

Study Guide

To successfully complete this module, complete the following tasks in the order listed. Check each one off as you complete it.

1. ____ Read the Goal and Performance Indicators on the cover of this module. This will inform you of what you are expected to gain from completing this module and how you will demonstrate that knowledge. Read the Introduction section to understand why this module is important.

2. ____ Study the Information section of this module to acquire the knowledge necessary to complete the Self and Post Assessment exams.

3. ____ Complete the Self Assessment exam and compare your answers with those on the Self Assessment Answer Sheet on the page immediately following the exam. Re-study or ask your instructor for help on any questions you have trouble with. The Self Assessment exam will help you determine how well you are likely to do on the Post Assessment.

4. ____ Complete the Post Assessment exam and turn your answers in to your instructor. It is recommended that you score 90% or better on the Post Assessment before going on to the next module.

Information

AWLS AND PUNCHES

An awl consists of a pointed steel shaft set in a handle. (See Fig. E-26.) It is used for making holes in wood and other relatively soft materials for starting nails and screws; as a scriber to mark lines; and as a light-duty drift to hold or align materials such as sheet metal or carpeting during fabrication and installation work.

A punch is a solid bar of tool steel, usually of hexagonal stock, that is used for such jobs as marking the centers of holes, driving pins or shafts in holes, and making and aligning holes. Punches are of several different types, each type having its special purpose. A set of the most commonly used punches is shown in Fig. E-27. Typical uses for each of the punches illustrated are:

- Long tapered punch--aligning holes in two pieces of material
- Center punch--marking centers for drilling holes
- Pin punch--driving pins or shafts in deep holes
- Hand punch--driving large shafts; punching holes in sheet metal
- Prick punch--marking lines with dots to indicate cuts or bends in sheet metal

Fig. E-26. Scratch awl

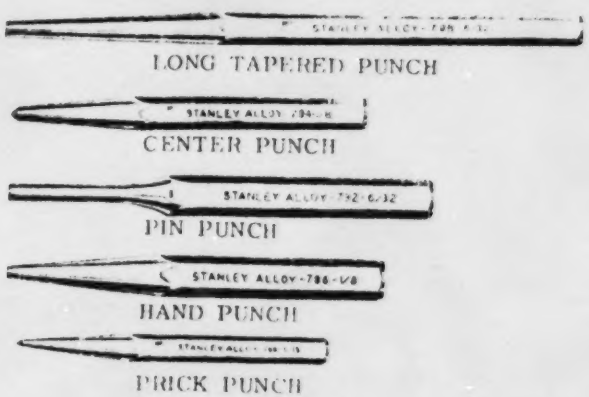


Fig. E-27. A set of punches

HAND BRACES AND BITS

A hand brace is a crank-like tool with a chuck for holding bits of various kinds of boring and drilling tools and for driving and countersinking screws.

RATCHET HAND BRACE

The most useful brace is the type having a reversible ratchet device that permits the user to bore in close quarters without making a full turn of the handle. (See Fig. E-28.) The size of a brace is determined by the sweep of the handle; the 10-in. brace is a commonly used size.

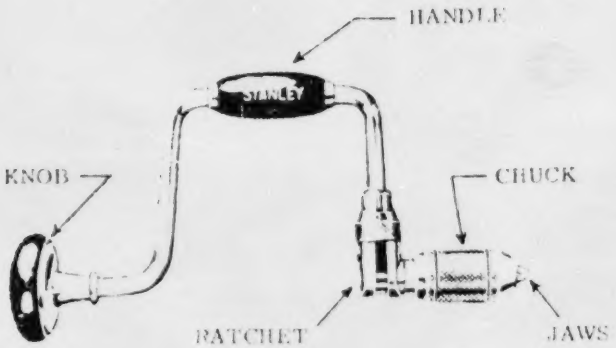


Fig. E-28. Ratched hand brace

AUGER BITS

Auger bits, the points most often used with hand braces, are designed for boring holes in wood. They are classified according to overall length as dowel bits, medium bits, and ship augers (4-1/4 in., 7 to 9 in., and 18 to 24 in. long, respectively). Auger bits are made in three styles: solid center, single twist (spiral center), and double twist. They are sized according to head diameter in sixteenths of an inch; thus, a number 9 bit has 9/16 in. head diameter.

PARTS OF AN AUGER BIT

The parts of a single-spur, double-twist auger bit are shown in Fig. E-29; the parts of a common double-spur auger bit head are shown in Fig. E-30.

THE HEAD OF THE BIT. The head of an auger bit consists of the lead screw, the spurs or nibs, the lips and the throat. The depth of the hole cut by each revolution of the bit depends upon the pitch of the lead screw threads. The spurs or nibs score the outer edge of the chip in advance of the cutting edges of the lips, which cut the chips and start them on their outward journey through the throat.

THE TWIST. The twist conveys the chips to the mouth of the hold. The twist should have a diameter slightly less than that of the head to permit it to follow the head into the hole with minimum friction.

THE SHANK AND THE TANG. The round shank of an auger bit ends in a square, tapered tang that fits into the two-jawed chuck of the brace.

Fig. E-29. Parts of an auger bit

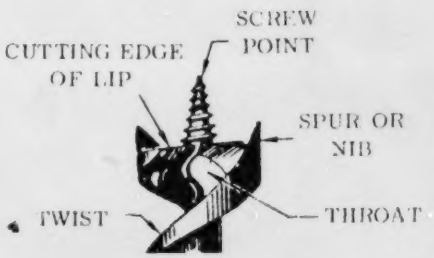


Fig. E-30. Parts of auger-bit head

SHARPENING AN AUGER BIT

Auger bits can be sharpened with a special double-ended, tapered file. One end of the file has serrated edges only; the other, serrated faces only. (See Fig. E-31.) The auger-bit lips and spurs can be dressed with this file without damage to adjacent surfaces. Only the upper edges of the lips and the inner leading edges of the spurs are filed in sharpening an auger bit.

Fig. E-31. Auger-bit file

OTHER TYPES OF BITS USED IN HAND BRACES

In addition to the auger bit, several other types of bits are made for use in the hand brace. Among these are the Forstner bit, the countersink bit, the expansion bit, the wood-boring brace drill (twist bit), the lock-set bit, and the screwdriver bit. (See Fig. E-32.) The Forstner bit has no screw or projecting spurs; it is used in place of the auger bit in jobs where cutting completely through the wood

is not desired or where the screw and spur impressions left by an auger bit must be avoided. The countersink bit is used to enlarge and taper the mouth of a hole for a flat-head screw. Expansion bits are made with adjustable cutters of different sizes; they can be used to bore holes up to 3 in. in diameter. Wood-boring brace drills (twist bits) are sized from 1/8 in. to 1/2 in. in thirty-seconds of an inch; a similar type of twist bit with a shallower-angled tip can be used for drilling in metal as well as boring in wood. Lock-set bits are used for shallow boring of large-diameter holes, especially for tubular door locks; they are made in sizes from 1-5/8 in. to 2-1/8 in. Screwdriver bits for hand braces are available as conventional or Phillips types.

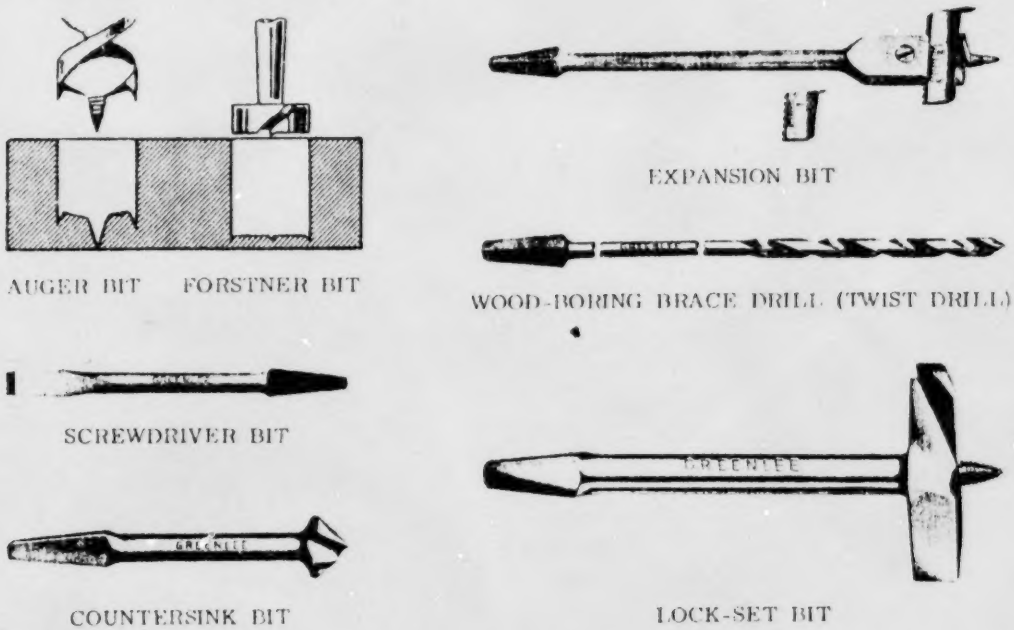


Fig. E-32. Bits for use in a hand brace

HAND DRILLS, BREAST DRILLS AND AUTOMATIC DRILLS

Although the portable electric drill is now preferred for most light drilling on the job, manually operated drills--hand drills, breast drills and automatic or push drills--still have their place in the skilled trades. (See Fig. E-33.) They are not dependent upon the availability of electric power, and for certain kinds of precision drilling their excellent controllability can give them an advantage over the faster and more efficient electric drill.

HAND DRILL

BREAST DRILL

AUTOMATIC OR
PUSH DRILL

Fig. E-33. Manually operated drills

HAND DRILLS

Hand drills, which are operated by means of a geared handle, are used for making small holes in wood, metal or masonry. They are designed to use round, straight-shank twist drills ranging in size up to 1/4 in. Special carbide-tipped twist drills are used for drilling in masonry.

BREAST DRILLS

A breast drill is similar in construction to a hand drill, but it is a heavier tool made for drilling holes up to 1/2 in. in diameter. Instead of a handle at the end, it has a plate against which the user bears with his cheek or abdomen while using both hands to steady and operate the drill. The breast drill, like the hand drill, is designed to use round, straight-shank twist drills.

AUTOMATIC DRILLS

The automatic drill or push drill is used for making small holes in wood. It is similar to the spiral ratchet screwdriver in that it is operated by pushing the handle, which has a spring-return action. One type of ratchet screwdriver can in fact be converted to a push drill with an optional special chuck and drill set.

The special drill points for the automatic drill have straight-fluted shanks and range in diameter from 1/64 inch to 1/16 inch. The push drill is most useful for the quick drilling of holes for screws; it can be used with one hand, leaving the other free to hold the work.

CORRECT PROCEDURE FOR BORING AND DRILLING

The apprentice should observe the following rules for the correct use and care of boring and drilling tools:

- Select a bit or drill that is the right type and size for the job. When an auger bit is to be used, choose the shortest one practicable for the job.
- Fasten the bit or drill securely in the chuck of the brace or hand drill.
- Locate the starting position with an awl or a center punch to prevent the drill from wandering on the material.
- Keep the brace or hand drill at a constant angle to the work surface and employ moderate but steady pressure to make a clean hole and avoid breaking the drill bit.
- Do not make the hole deeper than necessary. If a twist drill penetrates beyond the region of the twist, the chips will not clear from the hole.
- Use a drill gage or an auger bit gage when it is necessary to limit the depth of the hole. Such a gage can be made by drilling a hole through a length of dowel. (See Fig. E-34.)
- Protect twist drills and bits from rust, and keep their cutting edges sharp. Wipe them with a lightly oiled cloth from time to time, and store them so that their cutting edges will not be dulled by contact with other tools.

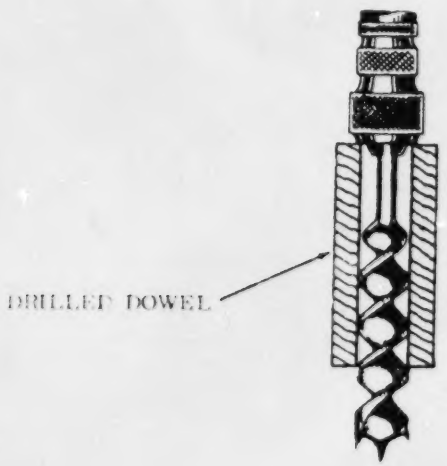
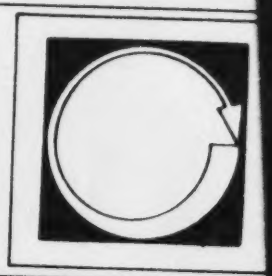


Fig. E-34. An auger-bit gage

Self Assessment



Read each statement and decide whether it is true or false. Write T if the statement is true; write F if the statement is false.

1. ____ An awl can be used as a scriber.
2. ____ A center punch is used for driving pins.
3. ____ The size of a hand brace is determined by its chuck opening.
4. ____ A number 4 auger bit is 1/4 in. in diameter.
5. ____ The twist of an auger bit is the pitch of its lead screw threads.
6. ____ The part of an auger bit that scores the outer edge of the cut is the spur.
7. ____ To sharpen an auger bit, only the upper edges of the cutting lips and the inner leading edges of the spurs should be filed.
8. ____ The Forstner bit has a long screw point.
9. ____ Round, straight-shank twist drills are used in a hand brace.
10. ____ Hand drills are used for drilling small holes in wood, metal or masonry.
11. ____ A breast drill is forced against the work with the heel of one hand.
12. ____ Drill points for automatic drills are from 1/8 in. to 1/4 in. in diameter.
13. ____ Auger bits and twist drills should be lightly oiled occasionally to keep them from rusting.

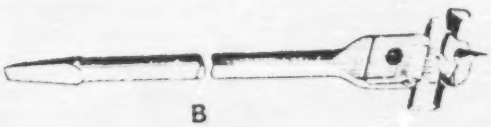
SELF ASSESSMENT ANSWER SHEET

1. T
2. F
3. F
4. T
5. F
6. F
7. T
8. F
9. T
10. T
11. F
12. F
13. T

Post Assessment

A group of boring and drilling tools is shown on this page. In each space in the numbered column below, write the letter of the illustrated tool that matches the tool named in the column.

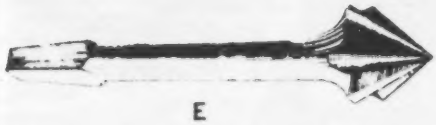
A



B

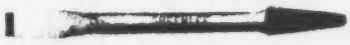
C

D



E

F



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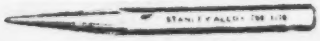
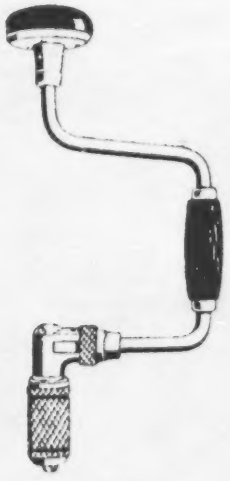
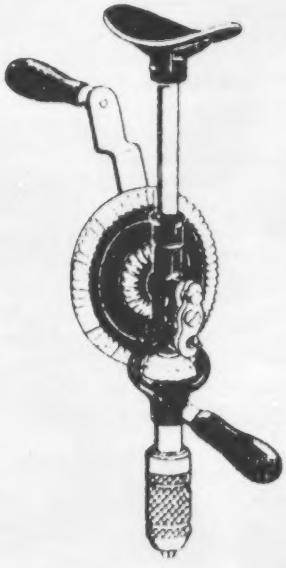


I



J

K



L

1. ____ brace
2. ____ push drill
3. ____ scratch awl
4. ____ hand punch
5. ____ auger bit
6. ____ expansion bit
7. ____ countersink bit
8. ____ breast drill
9. ____ twist drill
10. ____ forstner bit

Listed below each numbered item are four possible answers or completing phrases. Decide which of the four is correct, or most nearly correct; then write the corresponding letter in the blank space to the left of that item.

11. ____ The tool used for tapering the mouth of a hole for a flat-head screw is called a(n):

a. forstner bit
b. countersink bit
c. expansion bit
d. awl

12. ____ The tang of a bit for a hand brace is:

a. fluted
b. round and straight
c. twisted
d. square and tapered

13. ____ A hand brace is sized by its:

a. sweep of handle
b. auger bit capacity
c. maximum chuck opening
d. weight

14. ____ Which one of the following bits could be used to bore a 3" diameter hole through a piece of wood?

a. forstner bit
b. twist drill
c. expansion bit
d. countersink bit

15. ____ Drill points for push drills range in size from:

a. 1/64" to 1/16"
b. 1/32" to 1/8"
c. 1/16" to 1"
d. 1/2" to 3/4"